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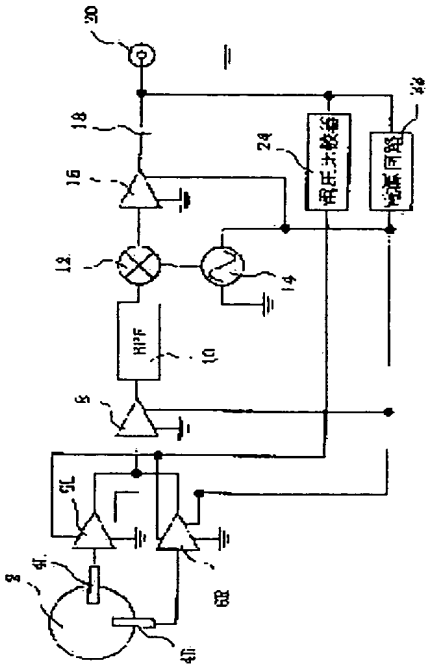
(54) FREQUENCY CONVERTER FOR SATELLITE SIGNAL

(57)Abstract:
PROBLEM TO BE SOLVED: To convert the frequencies of multiple satellite signals of different frequency bands transmitted from the same satellite orbit despite of one frequency converter for antenna for satellite signal receiving.
SOLUTION: A BS signal and a right turning CS signal have different frequency bands but have the same plane of polarization and right turning and left turning CS signals have the same frequency band but have different planes of polarization. The BS signal and the right turning CS signal are provided from a probe 4R. The left turning CS signal is provided from another probe 4L. A mixer 12 converts the frequencies of the BS signal and the right turning CS signal to the signals of respectively different frequency bands and converts the frequencies of the right turning and left turning CS signals to the same frequency band. The output signal of the mixer 12 is supplied to an output terminal 20. When a voltage supplied from the outside to the output terminal 20 is +15 V, a voltage comparator 24 operates an LNA 6R for right turn and supplies the BS signal and the right turning CS signal to the mixer 12. When the voltage of the output terminal 20 is +11 V, the voltage comparator 24 operates an LNA 6L for left turn and supplies the left turning CS signal to the mixer 12.



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CLAIMS

[Claim(s)]

[Claim 1] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. Although the 2nd and 3rd satellite signals have the same frequency band, it is equipment which carries out frequency conversion of the 1st [which has different plane of polarization] thru/or 3rd satellite signal. One set of the frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of a frequency band different, respectively, and carries out frequency conversion of the 2nd and 3rd satellite signals to the same frequency band The power converter for satellite signals possessing one output terminal to which the output signal of this frequency-conversion means is outputted, and a selection means to supply either of the 1st and 2nd satellite signals and the 3rd satellite signal to said frequency-conversion means according to the control signal supplied to this output terminal from the outside.

[Claim 2] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. The 1st frequency-conversion means which is equipment which carries out frequency conversion of the 1st [which has different plane of polarization although the 2nd and 3rd satellite signals have the same frequency band] thru/or 3rd satellite signal, and carries out frequency conversion of the 1st satellite signal to the signal of a predetermined frequency band, The 2nd frequency-conversion means which carries out frequency conversion of the 2nd and 3rd satellite signals to the signal of a different frequency band from said predetermined frequency band, The power converter for satellite signals possessing one output terminal to which the output signal of the 1st and 2nd frequency-conversion means is outputted, and a selection means to choose the 2nd or 3rd satellite signal, and to supply the 2nd frequency-conversion means according to the control signal supplied to this output terminal from the outside.

[Claim 3] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. Although the 2nd and 3rd satellite signals have the same frequency band, it is equipment which carries out frequency conversion of the 1st [which has different plane of polarization] thru/or 3rd satellite signal. One set of the frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of a frequency band different, respectively, and carries out frequency conversion of the 2nd and 3rd satellite signals to the signal of the same frequency band The power converter for satellite signals possessing one output terminal to which the output signal of this frequency-conversion means is outputted, and a selection means to choose one of the 1st thru/or 3rd satellite signals, and to supply said frequency-conversion means according to the control signal supplied to this output terminal from the outside.

[Claim 4] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. Although the 2nd and 3rd satellite signals have the same frequency band, it is equipment which carries out frequency conversion of the 1st [which has different plane of polarization] thru/or 3rd satellite signal. The 1st frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of two frequency bands different, respectively, The power converter for satellite signals possessing one output terminal to which the output signal of the 2nd frequency-conversion means which carries out frequency conversion of the 3rd satellite signal to the signal of a different frequency band from said two frequency bands, and the 1st and 2nd frequency-conversion means is outputted.

[Claim 5] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. The 1st frequency-conversion means

which is equipment which carries out frequency conversion of the 1st [which has different plane of polarization although the 2nd and 3rd satellite signals have the same frequency band] thru/or 3rd satellite signal, and carries out frequency conversion of the 1st satellite signal to the signal of a predetermined frequency band, The 2nd frequency-conversion means which carries out frequency conversion of the 2nd satellite signal to the signal of said predetermined frequency band and a different frequency band, The 3rd frequency-conversion means which carries out frequency conversion of the 3rd satellite signal to the signal of a different frequency band from said predetermined frequency band, Based on the control signal supplied to two output terminals to which the output signal of the 1st frequency-conversion means is outputted, and one output terminal, one side is chosen among the output signals of the 2nd and 3rd frequency-conversion means. The power converter for satellite signals possessing the 1st selection means supplied to one [said] output terminal, and the 2nd selection means which chooses one side among the output signals of the 2nd and 3rd frequency-conversion means, and is supplied to the output terminal of said another side based on the control signal supplied to the output terminal of another side.

[Claim 6] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. Although the 2nd and 3rd satellite signals have the same frequency band, it is equipment which carries out frequency conversion of the 1st [which has different plane of polarization] thru/or 3rd satellite signal. The 1st frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of two frequency bands different, respectively, The 2nd frequency-conversion means which carries out frequency conversion of the 3rd satellite signal to the signal of a different frequency band at least from one side between said two frequency bands, A separation means to separate into what carried out frequency conversion of the 1st satellite signal, and the thing which carried out frequency conversion of the 2nd satellite signal from the output signal of the 1st frequency-conversion means, Two output terminals to which what carried out frequency conversion of the 1st satellite signal from this separation means is outputted, The 1st selection means which supplies what was chosen according to the control signal supplied to one output terminal among what carried out frequency conversion of the 2nd satellite signal from said separation means, and the thing which carried out frequency conversion of the 3rd satellite signal from the 2nd frequency-conversion means to one [said] output terminal, According to the control signal supplied to the output terminal of another side, the 2nd selection means which supplies what was chosen among what carried out frequency conversion of the 2nd satellite signal from said separation means, and the thing which carried out frequency conversion of the 3rd satellite signal from the 2nd frequency-conversion means to the output terminal of said another side The power converter for satellite signals to provide.

[Claim 7] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. The 1st frequency-conversion means which is equipment which carries out frequency conversion of the 1st [which has different plane of polarization although the 2nd and 3rd satellite signals have the same frequency band] thru/or 3rd satellite signal, and carries out frequency conversion of the 1st satellite signal to the signal of a predetermined frequency band, The 2nd frequency-conversion means which carries out frequency conversion of the 2nd and 3rd satellite signals to the signal of the above-mentioned predetermined frequency band and a different frequency band, The 1st output terminal to which the output signal of the 1st frequency-conversion means is outputted, and the 2nd output terminal to which the output signal of the 2nd frequency-conversion means is outputted, The power converter for satellite signals possessing a selection means to supply what was chosen as the 2nd frequency-conversion means among the 2nd and 3rd satellite signals based on the control signal supplied to the 2nd output terminal from the outside.

[Claim 8] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. The 1st frequency-conversion means

which is equipment which carries out frequency conversion of the 1st [which has different plane of polarization although the 2nd and 3rd satellite signals have the same frequency band] thru/or 3rd satellite signal, and carries out frequency conversion of the 1st satellite signal to the signal of a predetermined frequency band, The 2nd frequency-conversion means which carries out frequency conversion of the 2nd satellite signal to the signal of the above-mentioned frequency band and a different frequency band, The 3rd frequency-conversion means which carries out frequency conversion of the 3rd satellite signal to the signal of a different frequency band from the signal which carried out frequency conversion of the satellite signal of the above 2nd, The power converter for satellite signals possessing the 1st output terminal to which the output signal of the 1st frequency-conversion means is outputted, and the 2nd output terminal to which the output signal of the 2nd and 3rd frequency-conversion means is outputted.

[Claim 9] It is the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. Although the 2nd and 3rd satellite signals have the same frequency band, it is equipment which carries out frequency conversion of the 1st [which has different plane of polarization] thru/or 3rd satellite signal. The 1st frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of two mutually different frequency bands, What carried out frequency conversion of the 1st satellite signal for the output signal of the 2nd frequency-conversion means which carries out frequency conversion of the 3rd satellite signal, and the 1st frequency-conversion means, A separation means to divide the 2nd satellite signal into what carried out frequency conversion, and the 1st output terminal, to which what carried out frequency conversion of the 1st satellite signal from the separation means is outputted, The power converter for satellite signals possessing the 2nd output terminal to which what carried out frequency conversion of the 2nd satellite signal from the separation means is outputted, and the 3rd output terminal to which what carried out frequency conversion of the 3rd satellite signal from the 2nd frequency-conversion means is outputted.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Since the satellite signal from geostationary satellites, such as a communication satellite and a broadcasting satellite, is outputted to a tuner etc., this invention relates to the equipment which carries out frequency conversion.
[0002]
[Description of the Prior Art] When receiving a satellite signal, in order to transmit a satellite signal to a tuner etc. after reception with a satellite signal receiving dish generally, carrying out frequency conversion with the power converter attached to the satellite signal receiving dish is performed. By the way, newly launching a communication satellite to the orbital position of a broadcasting satellite is planned. In this case, the frequency band of satellite broadcasting service differs from the frequency band of satellite communication. Therefore, in order to receive the satellite signal from a broadcasting satellite and a communication satellite, the object for broadcasting satellite reception and the object for satellite communication reception must be prepared as a satellite signal receiving dish which was mentioned above, respectively.
[0003]
[Problem(s) to be Solved by the Invention] However, when the antenna for satellite communication reception is also newly installed besides the antenna for satellite broadcasting service reception, the cost of an antenna turns high up and many installation tooth spaces are needed.
[0004] This invention aims at offering the power converter which can carry out frequency conversion of the satellite broadcasting service signal with which the frequency bands transmitted from the satellite on the same satellite's orbit differ, or the satellite communication signal, respectively, though it is one set of the power converter attached in the receiving dish of one set of a satellite signal.
[0005]
[Means for Solving the Problem] The 1st mode of the power converter for satellite signals by this invention carries out frequency conversion of the 1st [from a geostationary satellite] thru/or 3rd satellite signal with at least two different frequency bands. Although the 1st and 2nd satellite signals have a different frequency band, it has the same plane of polarization. Although the 2nd and 3rd satellite signals have the same frequency band, it has different plane of polarization. The 1st and 2nd satellite signals can be acquired from the same receiving means, for example, a probe. The 3rd satellite signal can be acquired from a receiving means other than the above-mentioned receiving means, for example, another probe. It should be transmitted from one set of a geostationary satellite, or the 1st thru/or 3rd satellite signal should be transmitted from two or more sets of geostationary satellites. This power converter can be attached in the antenna for for example, satellite signal reception. This power converter has one set of the frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of a frequency band different, respectively, and carries out frequency conversion of the 2nd and 3rd satellite signals to the same frequency band. The output signal of this frequency-conversion means is outputted to one output terminal. According to the control signal supplied to this output terminal from the outside, a selection means to supply either of the 1st and 2nd satellite signals and the 3rd satellite signal to a frequency-conversion means is established. As a control signal, the electrical potential difference from which a value changes, for example can also be used, and a pulse signal can also be used.
[0006] According to this power converter, according to the control signal supplied to the output terminal, the 1st and 2nd satellite signals are outputted to a frequency-conversion means, and, in a certain case, the signal which carried out frequency conversion of the 1st and 2nd satellite signals is outputted at an output terminal. When another, according to a control signal, the 3rd satellite signal is outputted to a frequency-conversion means, and the signal which carried out frequency conversion of the 3rd satellite signal is outputted to an output terminal. Thus, though it is one set of a power converter, frequency conversion of at least three satellite signals can be

carried out, respectively, it is not necessary to form a power converter according to an individual for every different frequency band, and an installation tooth space can be made small.
[0007] Other modes of the power converter for satellite signals of this invention carry out frequency conversion of the 1st thru/or 3rd satellite signal mentioned above. This power converter has the 2nd frequency-conversion means which carries out frequency conversion of the 1st frequency-conversion means which carries out frequency conversion of the 1st satellite signal to the signal of a predetermined frequency band, and the 2nd and 3rd satellite signals to the signal of a different frequency band from said predetermined frequency band. A receiving means to be also able to establish three receiving means for receiving the 1st thru/or 3rd satellite signal according to an individual, respectively, for example, a probe, and to receive the 1st and 2nd satellite signals in order to acquire the 1st thru/or 3rd satellite signal, A receiving means to receive the 3rd satellite signal may be established, and the 1st and 2nd satellite signals received with a receiving means to receive the 1st and 2nd satellite signals may be separated spectrally with a separation means, for example, a splitter. One output terminal to which the output signal of the 1st and 2nd frequency-conversion means is outputted is prepared. According to the control signal supplied to this output terminal from the outside, a selection means chooses the 2nd or 3rd satellite signal, and the 2nd frequency-conversion means is supplied.
[0008] According to this mode, in the 1st frequency-conversion means, frequency conversion of the 1st satellite signal is carried out, and it is outputted to the output terminal. On the other hand, frequency conversion of that as which either of the 2nd and 3rd satellite signals was chosen as by the selection means, and was chosen is supplied and carried out to the 2nd frequency-conversion means, and it is outputted to the output terminal. Therefore, what can turn frequency conversion of the three satellite signals up with one power converter, and carried out frequency conversion of the 1st satellite signal is always outputted to the output terminal. In addition, although many frequency-conversion means are required if it is the configuration which carries out frequency conversion of the 2nd and 3rd satellite signals with a respectively separate frequency-conversion means, chooses one side with a selection means among the outputs of these frequency-conversion means, for example, and is supplied to an output terminal If what was chosen among the 2nd and 3rd satellite signals is supplied to the 2nd frequency-conversion means like this mode, since only the 2nd frequency-conversion means can be used, circuitry is simplified.
[0009] Other modes of this power converter carry out frequency conversion of the 1st thru/or 3rd satellite signal mentioned above. This power converter has one set of the frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of a frequency band different, respectively, and carries out frequency conversion of the 2nd and 3rd satellite signals to the signal of the same frequency band. The output signal of this frequency-conversion means is outputted to one output terminal. According to the control signal supplied to this output terminal from the outside, a selection means chooses one of the 1st thru/or 3rd satellite signals, and said frequency-conversion means is supplied. As a selection means, when the receiving means according to individual, for example, a probe, receives the 1st thru/or 3rd satellite signal, respectively, a mere selecting switch can be used. One receiving means, for example, a probe, receives the 1st [which has the same plane of polarization], and 2nd satellite signals. Moreover, with the same frequency band as the 2nd satellite signal When another receiving means, for example, a probe, receives the 3rd satellite signal with which plane of polarization differs, a frequency adjustable filter means to choose either of the 1st [which is outputted from the same probe] and 2nd satellite signals, and the selecting switch which chooses the 2nd and 3rd satellite signals are used. In this case, as a control signal, two kinds the object for control of a frequency adjustable filter and for control of a selecting switch are used. For example, an electrical potential difference is used as one control signal, and a pulse signal can be used as a control signal of another side. As a frequency-conversion means, the signal of the same frequency can also be used as a local oscillation signal, for example, and the signal of a different frequency can also be used as a local oscillation signal, respectively.
[0010] According to this power converter for satellite signals, though it is one set of a power

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converter, frequency conversion is possible to the signal of a predetermined frequency respectively in three satellite signals, and frequency conversion only of the desired thing can be carried out among three satellite signals, and it can output to one output terminal.

[0011] Other modes of this invention are equipment which carries out frequency conversion of the 1st thru/or 3rd satellite signal mentioned above. This inverter has the 1st frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of two frequency bands different, respectively, and the 2nd frequency-conversion means which carries out frequency conversion of the 3rd satellite signal to the signal of a different frequency band from said two frequency bands. The 1st and 2nd frequency-conversion means are equipped with a local oscillation means to generate the local oscillation signal of a mutually different frequency. The output signal of the 1st and 2nd frequency-conversion means is outputted to one output terminal.

[0012] In this power converter for satellite signals, by the 1st and 2nd frequency-conversion means, frequency conversion of the 1st thru/or 3rd satellite signal is carried out to the signal of a mutually different frequency band, and it is outputted to the output terminal. Therefore, though it is one set of a power converter, what frequency conversion of the three satellite signals could be carried out, respectively, and carried out frequency conversion of the three satellite signals can be outputted to coincidence at one output terminal.

[0013] Another mode of the power converter for these satellite signals is equipment which carries out frequency conversion of the 1st thru/or 3rd satellite signal mentioned above. This power converter has the 1st frequency-conversion means which carries out frequency conversion of the 1st satellite signal to the signal of a predetermined frequency band, the 2nd frequency-conversion means which carries out frequency conversion of the 2nd satellite signal to the signal of said predetermined frequency band and a different frequency band, and the 3rd frequency-conversion means which carries out frequency conversion of the 3rd satellite signal to the signal of a different frequency band from said predetermined frequency band. The output signal of the 1st frequency-conversion means is outputted to two output terminals. Based on the control signal supplied to one output terminal, the 1st selection means chooses one side among the output signals of the 2nd and 3rd frequency-conversion means, and supplies one [said] output terminal. Based on the control signal supplied to the output terminal of another side, the 2nd selection means chooses one side among the output signals of the 2nd and 3rd frequency-conversion means, and supplies the output terminal of said another side.

[0014] In the power converter for these satellite signals, the signal which carried out frequency conversion of the 1st satellite signal is always outputted to two output terminals. And based on the control signal supplied to each output terminal from the outside, what carried out frequency conversion of the 2nd or 3rd satellite signal is supplied to an output terminal by the 1st and 2nd selection means. Therefore, though it is one set of a power converter, what can output upwards what carried out frequency conversion of the satellite signal to two networks, and always carried out frequency conversion of the 1st satellite signal can be outputted from each of two output terminals.

[0015] Other modes of the power converter for these satellite signals are equipment which carries out frequency conversion of the 1st thru/or 3rd satellite signal mentioned above. This power converter has the 1st frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of two frequency bands different, respectively, and the 2nd frequency-conversion means which carries out frequency conversion of the 3rd satellite signal to the signal of a different frequency band at least from one side between said two frequency bands. A separation means separates what carried out frequency conversion of the 1st satellite signal, and the thing which carried out frequency conversion of the 2nd satellite signal from the output signal of the 1st frequency-conversion means. What carried out frequency conversion of the 1st satellite signal from this separation means is outputted to two output terminals. According to the control signal supplied to one output terminal, the 1st selection means supplies the selected thing to one [said] output terminal among what carried out frequency conversion of the 2nd satellite signal from said separation means, and the thing which carried out frequency conversion of the 3rd satellite signal from the

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2nd frequency-conversion means. According to the control signal supplied to the output terminal of another side, the 2nd selection means supplies what was chosen among what carried out frequency conversion of the 2nd satellite signal from said separation means, and the thing which carried out frequency conversion of the 3rd satellite signal from the 2nd frequency-conversion means to the output terminal of said another side.

[0016] According to this power converter, the signal which carried out frequency conversion of the 1st satellite signal is outputted to two output terminals. And based on the control signal supplied to each output terminal from the outside, what carried out frequency conversion of the 2nd or 3rd satellite signal is outputted to an output terminal by the 1st and 2nd selection means. Therefore, though it is one set of a power converter, what can output upwards what carried out frequency conversion of the satellite signal to two networks, and always carried out frequency conversion of the 1st satellite signal can be outputted from an output terminal. And the number of frequency-conversion means to use it is two, and they can simplify a configuration.

[0017] Another mode of this power converter carries out frequency conversion of the 1st thru/or 3rd satellite signal mentioned above. This power converter has the 2nd frequency-conversion means which carries out frequency conversion of the 1st frequency-conversion means which carries out frequency conversion of the 1st satellite signal to the signal of a predetermined frequency band, and the 2nd and 3rd satellite signals to the signal of the above-mentioned predetermined frequency band and a different frequency band. The output signal of the 1st frequency-conversion means is outputted to the 1st output terminal. The output signal of the 2nd frequency-conversion means is outputted to the 2nd output terminal. Based on the control signal supplied to the 2nd output terminal from the outside, a selection means supplies what was chosen as the 2nd frequency-conversion means among the 2nd and 3rd satellite signals.

[0018] According to this power converter, what carried out frequency conversion of the 1st satellite signal with the 1st frequency-conversion means is outputted to the 1st output terminal. Frequency conversion of what was chosen among the 2nd or 3rd satellite signal is supplied and carried out to the 2nd frequency-conversion means, and it is outputted to the 2nd output terminal. Therefore, though it is one set of a power converter, what carried out frequency conversion of two or more satellite signals can be outputted, between two output terminals, what carried out frequency conversion of the 1st satellite signal is always outputted to one side, and what carried out frequency conversion of what was chosen among the 2nd and 3rd satellite signals is especially outputted to the output terminal of another side.

[0019] Other modes of this power converter carry out frequency conversion of the 1st thru/or 3rd satellite signal mentioned above. This power converter has the 3rd frequency-conversion means which carries out frequency conversion of the 1st frequency-conversion means which carries out frequency conversion of the 1st satellite signal to the signal of a predetermined frequency band, the 2nd frequency-conversion means which carries out frequency conversion of the 2nd satellite signal to the signal of the above-mentioned frequency band and a different frequency band, and the 3rd satellite signal to the signal of a different frequency band from the signal which carried out frequency conversion of the satellite signal of the above 2nd. The output signal of the 1st frequency-conversion means is outputted to the 1st output terminal. The output signal of the 2nd and 3rd frequency-conversion means is outputted to the 2nd output terminal.

[0020] According to this power converter, the signal which carried out frequency conversion of the 1st satellite signal is always outputted to the 1st output terminal, and the signal which carried out frequency conversion of the 2nd and 3rd satellite signals to a mutually different frequency band is outputted to the 2nd output signal. Therefore, though it is one set of a power converter, the signal which always carried out frequency conversion of the 1st thru/or 3rd satellite signal is outputted to two output terminals.

[0021] Other modes of the power converter for these satellite signals carry out frequency conversion of the 1st thru/or 3rd satellite signal mentioned above. This inverter has the 1st frequency-conversion means which carries out frequency conversion of the 1st and 2nd satellite signals to the signal of two mutually different frequency bands, and the 2nd frequency-

conversion means which carries out frequency conversion of the 3rd satellite signal. Furthermore, it also has a separation means to separate into what carried out frequency conversion of the 1st satellite signal for the output signal of the 1st frequency-conversion means, and the thing which carried out frequency conversion of the 2nd satellite signal. What carried out frequency conversion of the 1st satellite signal from the separation means is outputted to the 1st output terminal. What carried out frequency conversion of the 2nd satellite signal from the separation means is outputted to the 2nd output terminal. What carried out frequency conversion of the 3rd satellite signal from the 2nd frequency-conversion means is outputted to the 3rd output terminal.

[0022] In the power converter for these satellite signals, though it is one set of a power converter, what carried out frequency conversion of the three satellite signals, respectively can be outputted, and, moreover, what carried out frequency conversion of the 1st thru/or 3rd satellite signal to each of three output terminals is outputted.

[0023]

[Embodiment of the Invention] The power converter of the gestalt of operation of the 1st of this invention carries out frequency conversion of what received three satellite signals transmitted from the geostationary satellite launched by the location on the same geostationary orbit, for example, location of the 110 east longitudes, for example, a broadcasting satellite, and the communication satellite with one set of a receiving antenna, and an offset parabolic antenna.

[0024] Three satellite signals are the 1st satellite signal, 11.713 [for example,], thru/or a 12.01GHz frequency band, and are at the satellite broadcasting service signal (BS signal is called below.) of a dextrorotation circularly-polarized wave, the 2nd satellite signal, 12.2 [for example,], or a 12.75GHz frequency band with the satellite communication signal (a levorotation CS signal is called hereafter.) of a left hand circular polarization in the satellite communication signal (a dextrorotation CS signal is called hereafter.) of a dextrorotation circularly-polarized wave, 12.2, or 12.75GHz. BS signal and the dextrorotation CS signal have the same plane of polarization, although frequency bands differ. The dextrorotation and a levorotation CS signal have different plane of polarization, although the frequency band is the same.

[0025] This frequency converter is attached to one set of the primary radiator 2 shown in drawing 1 of the above-mentioned offset parabolic antenna, and is formed. It is arranged so that the include angle of 90 degrees may be made mutually, the receiving means for receiving BS signal and the dextrorotation CS signal which have the same plane of polarization in a primary radiator 2, for example, probe 4R, and the receiving means for receiving a levorotation CS signal, for example, probe 4L.

[0026] BS signal and a dextrorotation CS signal make a part of selection means, for example, are amplified by low noise amplifier (LNA for dextrorotation is called hereafter.) 6R for dextrorotation. A levorotation CS signal makes a part of selection means, for example, is amplified by low noise amplifier (LNA for levorotation is called hereafter.) 6L for levorotation. LNA(s) 6R and 6L for the object for these dextrorotation and levorotation operate, when a control signal is supplied so that it may mention later.

[0027] The object for these dextrorotation and the signal from LNA 6R or 6L for levorotation are supplied to the common low noise amplifier (it calls [LNA] hereafter.) 8, and are supplied to the frequency-conversion means 12, for example, a mixer, through the band pass filter 10 whose extract means, for example, a passband, are 11.713 thru/or 12.75GHz. The 10.678GHz local oscillation signal is supplied to this mixer 12 from the local oscillator 14, for example. Therefore, when BS signal and the dextrorotation CS signal are supplied, a mixer 12 carries out frequency conversion of the BS signal to BS intermediate frequency signal whose frequency bands are 1035 thru/or 1332MHz, and carries out frequency conversion of the dextrorotation CS signal to the dextrorotation CS intermediate frequency signal whose frequency bands are 1522 thru/or 2072MHz. Similarly, a mixer 12 carries out frequency conversion of the levorotation CS signal to the levorotation CS intermediate frequency signal whose frequency bands are 1522 thru/or 2072MHz, when the levorotation CS signal is supplied.

[0028] After the output signal of this mixer 12 is amplified by the intermediate frequency amplifier 16, it is supplied to one output terminal 20 through a blocking capacitor 18. This output

terminal 20 is connected to the tuner which is not illustrated through the transmission line, for example, a coaxial cable. Therefore, the output signal of a mixer 12 is supplied to a tuner. The tuner is constituted by the output terminal 20 possible [supply] through the coaxial cable in the direct current voltage whose control signal, for example, an electrical potential difference, is +15V or +11V. The direct current voltage of +15V or +11V supplied to the output terminal 20 is supplied to a power circuit 22, it is changed into the value defined beforehand, LNA6R for dextrorotation, LNA6L for levorotation, community LNA8, a local oscillator 14, and intermediate-frequency-amplifier 16 grade are supplied, and it always operates except LNA6R for dextrorotation, and LNA6L for levorotation. In addition, since diode etc. is used for a mixer 12, current supply is not performed, but current supply is performed when it constitutes a mixer using an active element.

[0029] It is judged whether or or +11V to which the direct current voltage of +15V or +11V supplied to the output terminal 20 is supplied to the electrical-potential-difference comparator 24 which makes a part of selection means, and +15V are supplied are supplied. That is, the electrical potential difference of +15V or +11V acts also as a control signal. When the electrical-potential-difference comparator 24 judges that the electrical potential difference which is +15V is supplied, as LNA6R for dextrorotation operated and mentioned above with the selection signal from the electrical-potential-difference comparator 24, BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal are outputted to an output terminal 20. When the electrical-potential-difference comparator 24 judges that the electrical potential difference which is +11V is supplied, as LNA6L for levorotation operated and mentioned above with the selection signal from the electrical-potential-difference comparator 24, a levorotation CS intermediate frequency signal is outputted to an output terminal 20.

[0030] Thus, though it is one set of a power converter, since frequency conversion of BS signal, a dextrorotation CS signal, and the levorotation CS signal can be carried out, respectively, by attaching this power converter in one set of an offset parabola reflecting mirror, frequency conversion of the three satellite signals can be carried out, a big installation tooth space cannot be needed, and cost can be reduced. Moreover, what carried out frequency conversion of the desired signal can be outputted to a tuner by setting the value of direct current voltage to +15V or +11V.

[0031] The gestalt of the 2nd operation is attached in the location where it differs from probe 4L 90 degrees in a primary radiator 2 unlike 4R 180 degrees, the receiving means, for example, probe 4BS, of BS signal reception only, as shown in drawing 2 . BS signal received by this probe 4BS is supplied to low noise amplifier (LNA for BS is called below.) 61BS for BS, is further amplified by LNA62BS for BS, and is supplied through the band pass filter 26 whose extract means, for example, a passband, are 11.713 thru/or 12.01GHz, the 2nd frequency-conversion means, for example, mixer 12BS. The 10.678GHz local oscillation signal is supplied to mixer 12BS from the local oscillator 14. Therefore, mixer 12BS carries out frequency conversion of the BS signal to 1035 thru/or 1332MHz BS intermediate frequency signal, and outputs it to an output terminal 20 through a mixer 28, the intermediate frequency amplifier 16, and a blocking capacitor 18.

[0032] Probes 4L and 4R, LNA6R for dextrorotation, and LNA6L for levorotation -- common -- LNA8 is constituted like the gestalt of the 1st operation, and is common -- the dextrorotation CS signal or levorotation CS signal from LNA8 is supplied to a mixer 12 through the band pass filter 30 whose extract means, for example, a passband, are 12.2GHz thru/or 12.75GHz. A mixer 12 outputs 1522 thru/or the 2072MHz dextrorotation, or levorotation CS intermediate frequency signal which carried out frequency conversion of a dextrorotation CS signal or the levorotation CS signal, and this is outputted to an output terminal 20 through a mixer 28, the intermediate frequency amplifier 16, and a blocking capacitor 18.

[0033] A power circuit 24 supplies the direct current voltage which transformed into the predetermined electrical potential difference the electrical potential difference of +11V or +15V supplied to the output terminal 20 to LNA61BS for BS, 62BS, LNA6R for dextrorotation, LNA6L for levorotation, community LNA8, a local oscillator 14, and the intermediate frequency amplifier 16. Devices other than LNA6R for dextrorotation and LNA6L for levorotation always operate

among these devices. Therefore, BS intermediate frequency signal is always outputted to the output terminal 20. When the electrical potential difference supplied to the output terminal 20 is +15V, the electrical-potential-difference comparator 22 operates LNA6R for dextrorotation. Therefore, a dextrorotation CS intermediate frequency signal is outputted to an output terminal 20. + When the electrical potential difference of 11V is supplied to an output terminal 20, the electrical-potential-difference comparator 22 operates LNA6L for levorotation. Therefore, a levorotation CS intermediate frequency signal is outputted to an output terminal 20. Thus, when the electrical potential difference of +15V is supplied from an output terminal 20, BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal are outputted to an output terminal 20, and when the electrical potential difference of +11V is supplied from the output terminal 20, BS intermediate frequency signal and a levorotation intermediate frequency signal are outputted to an output terminal 20.

[0034] Thus, though it is one set of a power converter, frequency conversion of the three satellite signals can be carried out, and space-saving and low cost can be planned like the gestalt of the 1st operation. And what carried out frequency conversion of the satellite broadcasting service signal is always outputted to the output terminal 20.

[0035] The gestalt of the 3rd operation is shown in drawing 3 . Like the gestalt of the 2nd operation, although the gestalt of this operation makes BS intermediate frequency signal always output to an output terminal 20, it uses only as the object for dextrorotation, and two probes 4R and 4L for levorotation the probe formed in a primary radiator 2. Therefore, BS signal and a dextrorotation CS signal are amplified by LNA(s) 61R and 62R for dextrorotation by which two-step cascade connection was carried out, and it is separated spectrally into BS signal and a dextrorotation CS signal with the separation means 32, for example, a splitter. BS signal is supplied to mixer 12BS for BS through the band pass filter 26 for BS, and frequency conversion is carried out to BS intermediate frequency signal, and it is outputted to an output terminal 20 through a mixer 28, the intermediate frequency amplifier 16, and a blocking capacitor 18.

[0036] The dextrorotation CS signal from a splitter 32 is supplied to one contact 34R of the selection means 34, for example, a selecting switch. The levorotation CS signal which was received by probe 4L and amplified by LNA(s) 61L and 62L for levorotation by which two-step cascade connection was carried out is supplied to contact 34L of another side of this selecting switch 34. Contact 34c of this selecting switch 34 contacts contact 34R with the selection signal from the electrical-potential-difference comparator 22, when the direct current voltage whose electrical-potential-difference comparator 22 is +15V was supplied and it judges. Therefore, a dextrorotation CS signal is supplied to a mixer 12 through a selecting switch 34 and the band pass filter 30 for CS, and frequency conversion is carried out to a dextrorotation CS intermediate frequency signal, and it is outputted to an output terminal 20 through a mixer 28, the intermediate frequency amplifier 16, and a blocking capacitor 18. Moreover, when the electrical-potential-difference comparator 22 judges that the direct current voltage which is +11V is outputted to the output terminal 20, contact 34c of a selecting switch 34 contacts contact 34L. Therefore, a levorotation CS signal is supplied to a mixer 12 through a selecting switch 34 and the band pass filter 30 for CS, and frequency conversion is carried out to a levorotation CS intermediate frequency signal, and it is outputted to an output terminal 20 through a mixer 28, the intermediate frequency amplifier 16, and a blocking capacitor 18.

[0037] Since the selecting switch 34 is performing selection with a dextrorotation CS signal and a levorotation CS signal and it is always necessary to supply BS signal to mixer 12BS with this configuration While the electrical potential difference of +15V or +11V is supplied to the output terminal 20, to LNA(s) 61R and 62R for dextrorotation, from a power circuit 24, the operating voltage changed into the predetermined electrical potential difference is supplied, and these are always operating like a local oscillator 14 and the intermediate frequency amplifier 16. In addition, while the electrical potential difference of +11V is supplied to the output terminal, the operating voltage changed into the predetermined electrical potential difference from the power circuit 24 is supplied to LANs 61L and 62L for levorotation. Therefore, when the electrical potential difference of +15V is supplied to an output terminal 20, BS intermediate frequency signal and CS dextrorotation intermediate frequency signal are outputted to an output terminal 20, and when

the electrical potential difference which is +11V is supplied, BS intermediate frequency signal and a levorotation CS intermediate frequency signal are outputted to an output terminal 20.
[0038] The gestalt of the 4th operation is shown in drawing 4 . BS intermediate frequency signal, a dextrorotation CS intermediate frequency signal, or a levorotation CS intermediate frequency signal is chosen according to any of the electrical potential difference which is +11V superimposed on +15V or a pulse signal, or +15V are supplied to an output terminal 20, and it is made to output to an output terminal 20 with the gestalt of this operation.
[0039] With the gestalt of this operation, like the gestalt of the 1st operation, BS signal and a dextrorotation CS signal are amplified by LNA6R for dextrorotation, and a levorotation CS signal is amplified by LNA6L for levorotation. the object for levorotation -- the time of the direct current voltage of +11V being supplied to an output terminal 20, as for LNA6L -- the selection signal from the electrical-potential-difference comparator 22 -- operating -- the object for dextrorotation -- LNA6R operates with the selection signal from the electrical-potential-difference comparator 22, when the direct current voltage of +15V is supplied to an output terminal 20.
[0040] LNA6R for dextrorotation, or LNA6L for levorotation -- ones of output signals is common -- after being amplified by LNA8, extract means, for example, band pass filter for BS, 26a and band pass filter 30a for CS are supplied. Band pass filter 26a for BS operates based on the signal which the pulse detector 36 generates, when the pulse signal is not contained in the signal supplied to the output terminal 20 from the tuner. Band pass filter 30a for CS operates based on the signal which the pulse detector 36 generates, when the pulse signal is not contained in the signal supplied to the output terminal 20.
[0041] Therefore, when the direct current voltage which is +11V superimposed on the pulse signal is supplied, a levorotation CS signal is amplified [LNA6L for levorotation, and / LNA8], and is supplied to a mixer 12 through band pass filter 30a for CS. On the other hand, when only the direct current voltage of +15V is supplied to the output terminal 20, a dextrorotation CS signal and BS signal are amplified [LNA6R for dextrorotation, and / LNA8], band pass filter 26a for BS is supplied, only BS signal is extracted, and a mixer 12 is supplied. + When the direct current voltage of 15V is overlapped on the pulse signal, a dextrorotation CS signal and BS signal are amplified [LNA6R for dextrorotation, and / LNA8], band pass filter 30a for CS is supplied, a dextrorotation CS signal is extracted and a mixer 12 is supplied. Namely, the number of the signals supplied to a mixer 12 is surely one among BS signal, a dextrorotation CS signal, and a levorotation CS signal.
[0042] In a mixer 12, since the 10.678GHz local oscillation signal is supplied from the local oscillator 14, when BS signal is supplied to a mixer 12, BS intermediate frequency signal is generated, when a dextrorotation CS signal is supplied, a dextrorotation CS intermediate frequency signal is generated, and when a levorotation CS signal is supplied, a levorotation CS intermediate frequency signal is generated. The output signal of a mixer 12 is outputted to an output terminal 20 through the intermediate frequency amplifier 16 and a blocking capacitor 18. In addition, the operating voltage changed into the predetermined electrical potential difference from the power circuit 24 is supplied to LNA6L for levorotation, LNA6R for dextrorotation, community LNA8, a local oscillator 14, and the intermediate frequency amplifier 16, as long as the direct current voltage of +15V or +11V is supplied to the output terminal 20. In this frequency converter, LNA6L for levorotation and not only LNA6R for dextrorotation but band pass filter 26for BS a and band pass filter 30a for CS function as a selection means.
[0043] The gestalt of the 5th operation is shown in drawing 5 . The gestalt of this operation outputs one of BS intermediate frequency signal, a dextrorotation CS intermediate frequency signal, and levorotation CS intermediate frequency signals to an output terminal 20 according to any of the direct current voltage of +15V of +11V and pulse signal superposition of pulse signal V [+15] non-superimposing and pulse signal superposition are supplied to an output terminal 20, and the frequency band of a dextrorotation CS intermediate frequency signal and a levorotation CS intermediate frequency signal differs from the gestalt of the 4th operation.
[0044] Therefore, the local oscillator 14 whose frequency is 10.678GHz like the gestalt of each above-mentioned operation of a local oscillator, and local-oscillator 14CS it is [CS] 11.2GHz

are prepared. Therefore, although BS intermediate frequency signals are 1035MHz thru/or 1332MHz like the gestalt of each above-mentioned operation, the dextrorotation and a levorotation CS intermediate frequency signal are 1000 thru/or 1550MHz. Although there is duplication of a frequency band, since they output only one intermediate frequency signal, even if BS intermediate frequency signal, the dextrorotation, and a levorotation CS intermediate frequency signal have duplication in a frequency band, there is no problem in an output terminal 20. A local oscillator 14 operates based on the signal from the pulse detector 36, when a pulse signal is not superimposed. Local-oscillator 14CS operates based on the signal from the pulse detector 36, when superimposed on the pulse signal. Similarly, band pass filter 26a for BS operates based on the signal from the pulse detector 36, when a pulse signal is not superimposed, and band pass filter 30a for CS operates based on the signal from the pulse detector 36, when superimposed on the pulse signal.

[0045] moreover, the object for levorotation -- LNA6L operates based on the signal from the electrical-potential-difference comparator 22, when the direct current voltage of +11V is supplied to the output terminal 20. the object for dextrorotation -- LNA6R operates based on the signal from the electrical-potential-difference comparator 22, when the direct current voltage of +15V is supplied to the output terminal 20. In addition, when the operating voltage changed into the predetermined electrical potential difference from the power circuit 24 when +15V were supplied to the output terminal 20 is supplied to LNA6R, community LNA8, a local oscillator 14, 14CS, and the intermediate frequency amplifier 16 and +11V are supplied to the output terminal 20, LNA6L, community LNA8, local-oscillator 14CS, and the intermediate frequency amplifier 16 are supplied. Therefore, when +15V that a pulse signal is not superimposed are supplied to the output terminal 20, +15V of pulse signal superposition of BS intermediate frequency signal in an output terminal 20 are supplied and +11V of pulse signal superposition of a dextrorotation CS intermediate frequency signal in an output terminal 20 are supplied, a levorotation CS intermediate frequency signal is outputted to an output terminal 20.

[0046] The gestalt of the 6th operation is shown in drawing 6 . The gestalt of this operation outputs one of BS intermediate frequency signal, a dextrorotation CS intermediate frequency signal, and levorotation CS intermediate frequency signals to an output terminal 20 according to any of the direct current voltage of +15V of +11V and pulse signal superposition of pulse signal V [+15] non-superimposing and pulse signal superposition are supplied to an output terminal 20 like the gestalt of the 5th operation, and the number of the band pass filters to be used is decreased. That is, the band pass filter 36 whose passbands are 11.713 thru/or 12.75GHz is formed in the output side of community LNA8, and the output signal is supplied to the mixer 12. The local oscillation signal of a local oscillator 14 (10.678GHz) or 14CS (11.2GHz) is supplied to the mixer 12. As an output signal of this mixer 12, BS intermediate frequency signal, a dextrorotation CS intermediate frequency signal, or a levorotation CS intermediate frequency signal is outputted. The output signal of this mixer 12 is supplied to the low pass filter 38 whose cut-off frequency is 1500MHz, the output signal of this low pass filter 38 is supplied to the intermediate frequency amplifier 16, the output signal of that intermediate frequency amplifier 16 is supplied to the high-pass filter 40 whose cut-off frequency is 1000MHz, and that output signal is supplied to an output terminal 20 through a blocking capacitor 18. Other configurations are the same as that of the gestalt of the 5th operation.

[0047] Thus, when constituted, the number of the band pass filters to be used is one sufficient, and there is no need of switching a band pass filter.

[0048] The gestalt of the 7th operation outputs what set CS levorotation signal to 2100 thru/or 2650MHz, and set frequency conversion of the CS dextrorotation signal for BS signal to 1522 thru/or 2072MHz at 1035 thru/or 1332MHz to an output terminal 20, as shown in drawing 7 .

[0049] Therefore, BS signal received by probe 4R and a dextrorotation CS signal are amplified by LNA(s) 61R and 62R for dextrorotation by which two-step cascade connection was carried out, and a passage frequency band is supplied to mixer 12R through band pass filter 30R for dextrorotation which is 11.713 thru/or 12.75GHz. The 10.678GHz local oscillation signal from local-oscillator 14R is supplied to mixer 12R, and BS intermediate frequency signal (1035MHz thru/or 1332MHz) and a dextrorotation CS intermediate frequency signal (1522MHz thru/or

2072MHz) are outputted from mixer 12R, and it is amplified by intermediate-frequency-amplifier 16R, and is outputted to an output terminal 20 through a mixer 28 and a blocking capacitor 18.
[0050] The levorotation CS signal received by probe 4L is amplified by LNA(s) 61L and 62L for levorotation by which two-step cascade connection was carried out, and a passage frequency band is supplied to mixer 12L through band pass filter 30L for levorotation which is 12.2 thru/or 12.75GHz. The 10.1GHz local oscillation signal is supplied to mixer 12L from local-oscillator 14L. Therefore, 2100 thru/or a 2650MHz levorotation CS intermediate frequency signal are outputted from mixer 12L, and this is amplified by intermediate-frequency-amplifier 16L, and is outputted to an output terminal 20 through a mixer 28 and a blocking capacitor 18.
[0051] The direct current voltage of +15V or +11V is supplied to an output terminal 20 from a tuner. This is supplied to a power circuit 24 and it is changed into a predetermined electrical potential difference. LNA61L for levorotation, 62L, LNA(s) 61R and 62R for dextrorotation, local oscillators 14L and 14R, and intermediate frequency amplifier 16L and 16R are supplied, and these always operate, as long as the direct current voltage of +11V or +15V is supplied to the output terminal 20. Therefore, BS intermediate frequency signal which is the frequency band mentioned above, CS intermediate frequency signal for dextrorotation, and CS intermediate frequency signal for levorotation are outputted to the output terminal 20, as long as the direct current voltage of +15V or +11V is supplied to the output terminal 20.
[0052] Though arrangement of a probe is the same as that of the gestalt of the 2nd operation and it is one set of a power converter as the gestalt of the 8th operation is shown in drawing 8 , it has two output terminals 20a and 20b. After BS signal from probe 4BS for BS signal reception formed in the primary radiator 2 is amplified by LNA61BS for BS, and 62BS, it is supplied to mixer 12BS for BS through the band pass filter 26 for BS. A 10.678GHz local oscillation signal is supplied to mixer 12BS from a local oscillator 14, and mixer 12BS outputs BS intermediate frequency signal to output terminals 20a and 20b through Mixers 28a and 28b, intermediate frequency amplifier 16a and 16b, and blocking capacitors 18a and 18b.
[0053] After the dextrorotation CS signal from probe 4for dextrorotation R formed in the primary radiator 2 is amplified by LNA(s) 61R and 62R for dextrorotation, it is supplied to mixer 12R for dextrorotation through band pass filter 30R for dextrorotation. A 10.678GHz local oscillation signal is supplied to this mixer 12R from a local oscillator 14, and mixer 12R supplies a dextrorotation CS intermediate frequency signal to the contacts 40R and 41R of the selection means 40 and 41, for example, two change-over switches.
[0054] After the levorotation CS signal from probe 4for levorotation L formed in the primary radiator 2 is amplified by LNA(s) 61L and 62L for levorotation, it is supplied to mixer 12L for levorotation through band pass filter 30L for levorotation. A 10.678GHz local oscillation signal is supplied to this mixer 12L from a local oscillator 14, and mixer 12L supplies CS intermediate frequency signal for levorotation to the contacts 40L and 41L of change-over switches 40 and 41.
[0055] Contact 40c of a change-over switch 40 is connected to mixer 28a, and when the direct current voltage supplied to output terminal 20a is +15V, a change-over signal is supplied from electrical-potential-difference comparator 22a so that contact 40R may be contacted. Therefore, the dextrorotation CS intermediate frequency signal from mixer 12R is supplied to output terminal 20a through mixer 28a, intermediate-frequency-amplifier 16a, and blocking capacitor 18a. Similarly, a change-over signal is supplied from electrical-potential-difference comparator 22a so that contact 40c of a change-over switch 40 may contact contact 40L, when the direct current voltage supplied to output terminal 20a is +11V. Therefore, the levorotation CS intermediate frequency signal from mixer 12L is outputted to output terminal 20a through mixer 28a, intermediate-frequency-amplifier 16a, and blocking capacitor 18a.
[0056] It connects with mixer 28b and contact 41c of a selecting switch 41 is also controlled by electrical-potential-difference comparator 22b the same with having mentioned above.
[0057] Power circuits 24a and 24b are established in output terminals 20a and 20b. When, as for these power circuits 24a and 24b, the direct current voltage of +15V or +11V is supplied to at least one side of one of the output terminals 20a and 20b, The operating voltage which changed the electrical potential difference of +15V or +11V into LNA61BS, 61R and 61L, 62BS, 62R and

62L, a local oscillator 14, and intermediate frequency amplifier 16a and 16b at the predetermined electrical potential difference is supplied, and these are operated.
[0058] Therefore, when the electrical potential difference of +15V is supplied to output terminal 20a, BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal are outputted to output terminal 20a, and when the electrical potential difference of +11V is supplied, BS intermediate frequency signal and a levorotation CS intermediate frequency signal are outputted to output terminal 20a. Similarly, when the electrical potential difference of +15V is supplied to output terminal 20b, BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal are outputted to output terminal 20b, and when the electrical potential difference of +11V is supplied, BS intermediate frequency signal and a levorotation CS intermediate frequency signal are outputted to output terminal 20b.
[0059] The gestalt of the 9th operation is shown in drawing 9 . the gestalt of the 8th operation of the gestalt of this operation -- the same -- two output terminals 20a and 20b, when it is alike, respectively and the electrical potential difference of +15V is supplied Although BS intermediate frequency signal and a levorotation CS intermediate frequency signal are outputted when BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal are outputted and the electrical potential difference of +11V is supplied, only probe 4R for dextrorotation and probe 4L for levorotation are used without forming the probe for BS reception.
[0060] Therefore, after BS signal and the dextrorotation CS signal which were received by probe 4R for dextrorotation are amplified by LNA(s) 61R and 62R for dextrorotation, they are supplied to mixer 12R for dextrorotation through band pass filter 30R for dextrorotation, and are changed into BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal by the 10.678GHz local oscillation signal from a local oscillator 14. This BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal are separated spectrally into BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal with the separation means 42, for example, a splitter, and BS intermediate frequency signal is supplied to output terminals 20a and 20b through Mixers 28a and 28b, intermediate frequency amplifier 16a and 16b, and blocking capacitors 18a and 18b. Moreover, a dextrorotation CS intermediate frequency signal is supplied to the contacts 40R and 41R of change-over switches 40 and 41.
[0061] After being amplified by LNA(s) 61L and 62L for levorotation, the levorotation CS signal received by probe 4L for levorotation is supplied to mixer 12L for levorotation through band pass filter 30L for levorotation, by the 10.678GHz local oscillation signal from a local oscillator 14, is changed into a levorotation CS intermediate frequency signal, and is supplied to the contacts 40L and 41L of change-over switches 40 and 41.
[0062] Contact 40c of a change-over switch 40 is connected to mixer 28a, and when the direct current voltage supplied to output terminal 20a is +15V, a change-over signal is supplied from electrical-potential-difference comparator 22a so that contact 40R may be contacted. Therefore, the dextrorotation CS intermediate frequency signal from mixer 12R is outputted to output terminal 20a through mixer 28a, intermediate-frequency-amplifier 16a, and blocking capacitor 18a. Similarly, a change-over signal is supplied from electrical-potential-difference comparator 22a so that contact 40c of a change-over switch 40 may contact contact 40L, when the direct current voltage supplied to output terminal 20a is +11V. Therefore, the levorotation CS intermediate frequency signal from mixer 12L is outputted to output terminal 20a through mixer 28a, intermediate-frequency-amplifier 16a, and blocking capacitor 18a. Contact 41c of a change-over switch 41 is similarly switched according to the electrical potential difference supplied to output terminal 20b by the change-over signal from electrical-potential-difference comparator 22b. Power circuits 24a and 24b are constituted like the gestalt of the 8th operation.

[0063] Therefore, when the direct current voltage of +15V is supplied to output terminal 20a, BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal are outputted to output terminal 20a, and when the direct current voltage of +11V is supplied to output terminal 20a, BS intermediate frequency signal and a levorotation CS intermediate frequency signal are outputted to output terminal 20b. The same is said of output terminal 20b.

Power circuits 24a and 24b are established in output terminals 20a and 20b. When, as for these power circuits 24a and 24b, the direct current voltage of +15V or +11V is supplied to at least one side of one of the output terminals 20a and 20b, The operating voltage which changed the electrical potential difference of +15V or +11V into LNA61BS, 61R and 61L, 62BS, 62R and 62L, a local oscillator 14, and intermediate frequency amplifier 16a and 16b at the predetermined electrical potential difference is supplied, and these are operated.

[0064] The gestalt of the 10th operation is shown in drawing 10 . When the gestalt of the 2nd operation and probe arrangement are the same and the direct current voltage of +15V is supplied to output terminal 20BS with the gestalt of this operation, When BS intermediate frequency signal is outputted to output terminal 20BS and the direct current voltage of +15V is supplied to output terminal 20CS, When a dextrorotation CS intermediate frequency signal is outputted to output terminal 20CS and the direct current voltage of +11V is supplied to output terminal 20CS, a levorotation CS intermediate frequency signal is outputted to output terminal 20CS.

[0065] Therefore, BS signal from probe 4BS for BS formed in the primary radiator 2 is amplified by LNA61BS for BS, and 62BS, it is supplied to mixer 12BS for BS through the band pass filter 26 for BS, and frequency conversion is carried out to BS intermediate frequency signal with the 10.678GHz local oscillation signal from a local oscillator 14, it is amplified by intermediate-frequency-amplifier 16BS for BS, and is outputted to output terminal 20BS through blocking capacitor 18BS. The direct current voltage of +15V supplied to output terminal 20BS is supplied to power circuit 24BS, is changed into a here predetermined electrical potential difference, is supplied to LNA61BS for BS, 62BS, a local oscillator 14, and intermediate-frequency-amplifier 16BS for BS, and operates these.

[0066] The dextrorotation CS signal from probe 4for dextrorotation R of the primary radiator 2 is amplified by LNA6R for dextrorotation, and is supplied [LNA8]. Similarly, the levorotation CS signal from probe 4for levorotation L of the primary radiator 2 is amplified by LNA6L for levorotation, and is supplied [LNA8]. The output signal of community LNA8 is supplied to mixer 12CS for CS through the band pass filter 30 for CS, and by the 10.678GHz local oscillation signal from a local oscillator 14, frequency conversion of it is carried out to CS intermediate frequency signal, and it is supplied to output terminal 20CS through intermediate-frequency-amplifier 16CS for CS, and blocking capacitor 18CS.

[0067] The direct current voltage of +15V or +11V supplied to output terminal 20CS is supplied to power circuit 24CS, is changed into a predetermined electrical potential difference, and is supplied to LNA6L for levorotation, LNA6R for dextrorotation, community LNA8, a local oscillator 14, and intermediate-frequency-amplifier 16CS for CS. Among these, although community LNA8, a local oscillator 14, and intermediate-frequency-amplifier 16CS for CS always operate with this direct current voltage, it operates that the electrical potential difference of output terminal 20CS is +15V based on the selection signal from the electrical-potential-difference comparator 22, when LNA6R for dextrorotation is detected by the electrical-potential-difference comparator 22. Therefore, CS intermediate frequency signal is a dextrorotation CS intermediate frequency signal at this time. That the electrical potential difference of output terminal 20CS is +11V operates based on the selection signal from the electrical-potential-difference comparator 22, when LNA6L for levorotation is detected by the electrical-potential-difference comparator 22. Therefore, CS intermediate frequency signal is a levorotation CS intermediate frequency signal at this time.

[0068] The gestalt of the 11th operation is shown in drawing 11 . When the direct current voltage of +15V or +11V is supplied to output terminal 20BS by the gestalt of this operation like the gestalt of the 10th operation, When BS intermediate frequency signal is outputted to output terminal 20BS and the direct current voltage of +15V is supplied to output terminal 20CS, When a dextrorotation CS intermediate frequency signal is outputted to output terminal 20CS and the direct current voltage of +11V is supplied to output terminal 20CS, a levorotation CS intermediate frequency signal is outputted to output terminal 20CS. However, probe 4R for dextrorotation and probe 4L for levorotation are used as a receiving probe.

[0069] Therefore, after BS signal and the dextrorotation CS signal which were received by probe

4R for dextrorotation are amplified by LNA(s) 61R and 62R for dextrorotation, they are separated spectrally into BS signal and a dextrorotation CS signal with the separation means 43, for example, a splitter. BS signal separated spectrally is supplied to mixer 12BS for BS through the band pass filter 26 for BS, and by the 10.678GHz local oscillation signal from a local oscillator 14, frequency conversion of it is carried out to BS intermediate frequency signal, and it is supplied to output terminal 20BS through intermediate-frequency-amplifier 16BS for BS, and blocking capacitor 18BS. When the direct current voltage of +15V or +11V is supplied to output terminal 20BS, power circuit 24BS transforms this electrical potential difference into a predetermined electrical potential difference, and is supplied and operated to LNA(s) 61R and 62R for dextrorotation, intermediate-frequency-amplifier 16BS, and a local oscillator 14.

[0070] The dextrorotation CS signal separated spectrally with the splitter 42 is supplied to contact 44R of a change-over switch 44. After the levorotation CS signal of probe 4L is amplified by LNA(s) 61L and 62L for levorotation, it is supplied to contact 44L of a selecting switch 44. It connects with contact 44R and contact 44c of a selecting switch 44 is connected to contact 44L at the time of +11V, when the electrical potential difference supplied to output terminal 20CS is +15V. Mixer 12CS is supplied through the band pass filter 30 for CS, by the 10.678GHz local oscillation signal from a local oscillator 14, frequency conversion of the dextrorotation or levorotation CS signal chosen by this selecting switch 44 is carried out to the dextrorotation or a levorotation CS signal, and it is supplied to output terminal 20CS through intermediate-frequency-amplifier 16CS for CS, and blocking capacitor 18CS. In addition, when the direct current voltage of +15V or +11V is supplied to output terminal 20CS, power circuit 24CS changes this into a predetermined electrical potential difference, supplies it to the object for dextrorotation and LNA(s) 61R, 62R, 61L, and 62L for levorotation, a local oscillator 14, and intermediate-frequency-amplifier 16CS for CS, and operates these.

[0071] The gestalt of the 12th operation is shown in drawing 12 . If the direct current voltage of +15V or +11V is supplied to output terminal 20BS or 20CS, the gestalt of this operation will output BS intermediate frequency signal to output terminal 20BS, and will output the dextrorotation CS intermediate frequency signal and levorotation CS intermediate frequency signal which changed the frequency band in output terminal 20CS.

[0072] Therefore, after BS signal and the dextrorotation CS signal which were received by probe 4R for dextrorotation are amplified by LNA(s) 61R and 62R for dextrorotation, they are separated spectrally into BS signal and a dextrorotation CS signal with a splitter 46. BS signal separated spectrally is supplied to mixer 12BS through band pass filter 26BS for BS, and by the 10.678GHz local oscillation signal from a local oscillator 14, frequency conversion of it is carried out to 1035 thru/or 1332MHz BS intermediate frequency signal, and it is supplied to output terminal 20BS through intermediate-frequency-amplifier 16BS for BS, and blocking capacitor 18BS.

[0073] The dextrorotation CS signal separated spectrally with the splitter 46 is supplied to mixer 12R through band pass filter 26R for dextrorotation, and after frequency conversion is carried out to a dextrorotation CS intermediate frequency signal (1522MHz thru/or 2072MHz) and being amplified by intermediate-frequency-amplifier 16R for dextrorotation by the local oscillation signal from a local oscillator 14, it is supplied to a mixer 48.

[0074] On the other hand, after the levorotation CS signal received by probe 4L is amplified by LNA(s) 61L and 62L for levorotation, it is supplied to mixer 12L through band pass filter 26L for levorotation, and after frequency conversion is carried out to 950 thru/or a 1500MHz levorotation CS intermediate frequency signal and being amplified by intermediate-frequency-amplifier 16L for levorotation by the 11.25GHz local oscillation signal from local-oscillator 14for levorotation L, it is supplied to a mixer 48. The levorotation and dextrorotation CS intermediate frequency signal which were mixed by the mixer 48 are outputted to output terminal 20CS through blocking capacitor 18CS.

[0075] The gestalt of the 13th operation is shown in drawing 13 . The gestalt of this operation outputs a levorotation CS intermediate frequency signal to output terminal 20BS at dextrorotation CS intermediate frequency signal and output terminal 20L at BS intermediate frequency signal and output terminal 20R, when +15V were supplied to three output terminal 20BS and 20R and the direct current voltage of +11V is supplied to 20L, though it is one set of a

power converter.
[0076] Therefore, BS signal and the dextrorotation CS signal which were received by probe 4R for dextrorotation are supplied to mixer 12R through LNA(s) 61R and 62R for dextrorotation, and band pass filter 26R for dextrorotation, and frequency conversion is carried out to 1035 1332MHz BS intermediate frequency signal and 1522 thru/or a 2072MHz dextrorotation CS intermediate frequency signal with the 10.678GHz local oscillation signal from a local oscillator 14, and they are separated spectrally into BS intermediate frequency signal and a dextrorotation CS intermediate frequency signal with a splitter 46.
[0077] BS intermediate frequency signal separated spectrally is outputted to output terminal 20BS through intermediate-frequency-amplifier 16BS for BS, and blocking capacitor 18BS. On the other hand, the dextrorotation CS intermediate frequency signal separated spectrally is outputted to output terminal 20R through dextrorotation CS intermediate-frequency-amplifier 16R and blocking capacitor 18R.
[0078] The levorotation CS signal received by probe 4L is supplied to mixer 12L through LNA(s) 61L and 62L for levorotation, and band pass filter 26L for levorotation, and is changed into a levorotation CS intermediate frequency signal (1522MHz thru/or 2072MHz) by the 10.678GHz local oscillation signal from a local oscillator 14. This levorotation CS intermediate frequency signal is supplied to output terminal 20L through levorotation CS intermediate-frequency-amplifier 16L and blocking capacitor 18L.
[0079] When the direct current voltage of +15V or +11V is supplied to three output terminal 20BS, or 20R and 20L, a power circuit 24 changes this into a predetermined electrical potential difference, supplies it to LNA(s) 61L, 62L, 61R, and 62R for the dextrorotation and levorotation, a local oscillator 14, the object for BS, the dextrorotation and levorotation CS intermediate-frequency-amplifier 16BS, and 16R and 16L, and operates these.
[0080] With the gestalt of each above-mentioned operation, although two thru/or three probes were formed to one primary radiator 2, one or two probes may be formed in two thru/or each of three primary radiators approached and arranged. Moreover, the primary radiator is unnecessary when using it with a flat antenna.
[0081]
[Effect of the Invention] As mentioned above, though it is one set of a power converter, since frequency conversion of two or more satellite signals of each with which frequency bands differ can be carried out to a predetermined frequency band according to this invention, when it attaches in one set of a satellite signal receiving dish, the installation tooth space of an antenna is small, and can consider as low cost.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the frequency converter of the gestalt of operation of the 1st of this invention.
[Drawing 2] It is the block diagram of the frequency converter of the gestalt of operation of the 2nd of this invention.
[Drawing 3] It is the block diagram of the frequency converter of the gestalt of operation of the 3rd of this invention.
[Drawing 4] It is the block diagram of the frequency converter of the gestalt of operation of the 4th of this invention.
[Drawing 5] It is the block diagram of the frequency converter of the gestalt of operation of the 5th of this invention.
[Drawing 6] It is the block diagram of the frequency converter of the gestalt of operation of the 6th of this invention.
[Drawing 7] It is the block diagram of the frequency converter of the gestalt of operation of the 7th of this invention.
[Drawing 8] It is the block diagram of the frequency converter of the gestalt of operation of the 8th of this invention.
[Drawing 9] It is the block diagram of the frequency converter of the gestalt of operation of the 9th of this invention.
[Drawing 10] It is the block diagram of the frequency converter of the gestalt of operation of the 10th of this invention.
[Drawing 11] It is the block diagram of the frequency converter of the gestalt of operation of the 11th of this invention.
[Drawing 12] It is the block diagram of the frequency converter of the gestalt of operation of the 12th of this invention.
[Drawing 13] It is the block diagram of the frequency converter of the gestalt of operation of the 13th of this invention.
[Description of Notations]
6L, 6R, 61L, 61R, 62L, 62R LNA for the levorotation and dextrorotation (selection means)
12 12R 12L 12BS 12CS Mixer (Frequency-Conversion Means)
20 20a, 20B 20BS 20CS 20L 20R Output Terminal
22 22a 22B Electrical-Potential-Difference Comparator (Selection Means)
26a 30a Band pass filter (selection means)
34 40 41 44 Change-over Switches (Selection Means)
36 Pulse Detector

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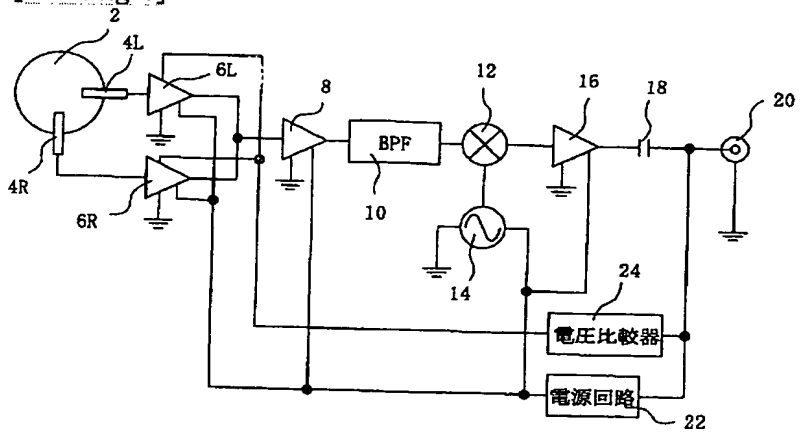
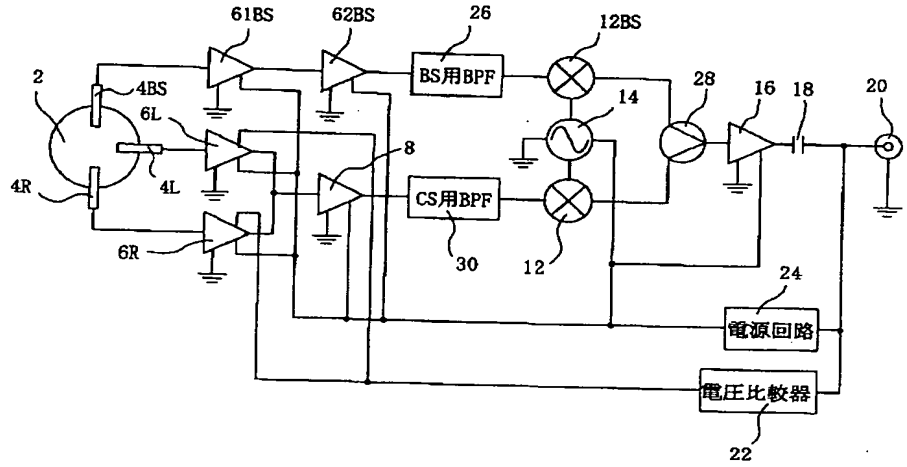
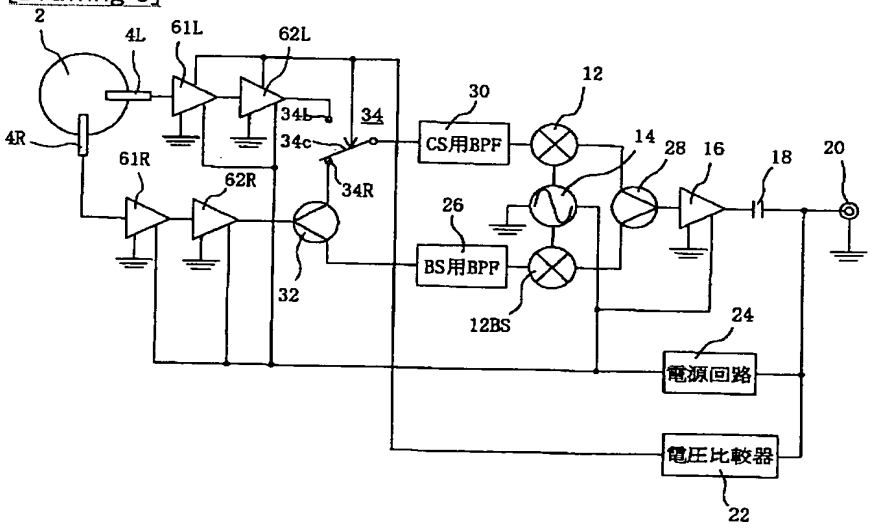
[Drawing 1]



[Drawing 2]



[Drawing 3]



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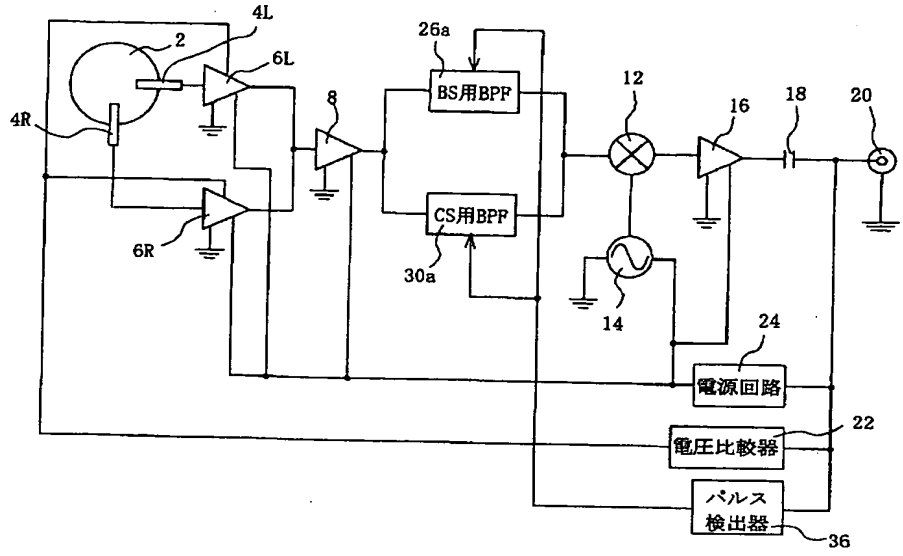
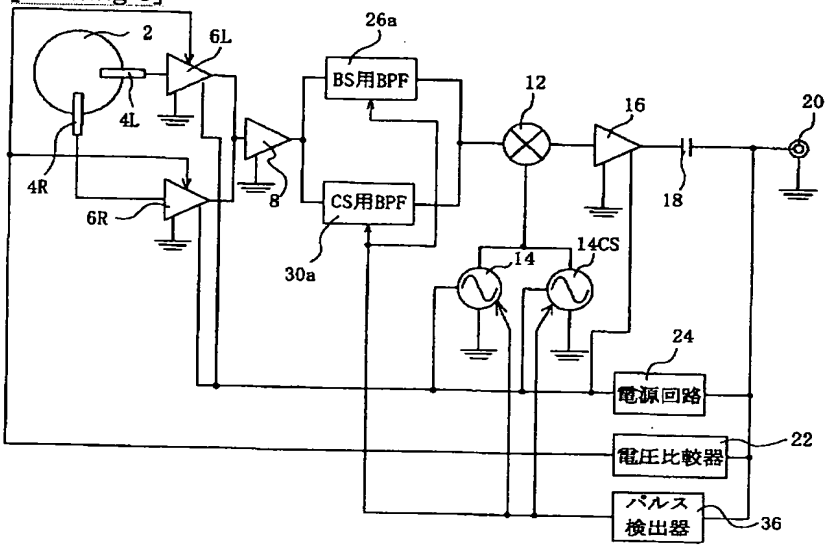
[Drawing 4]



[Drawing 5]



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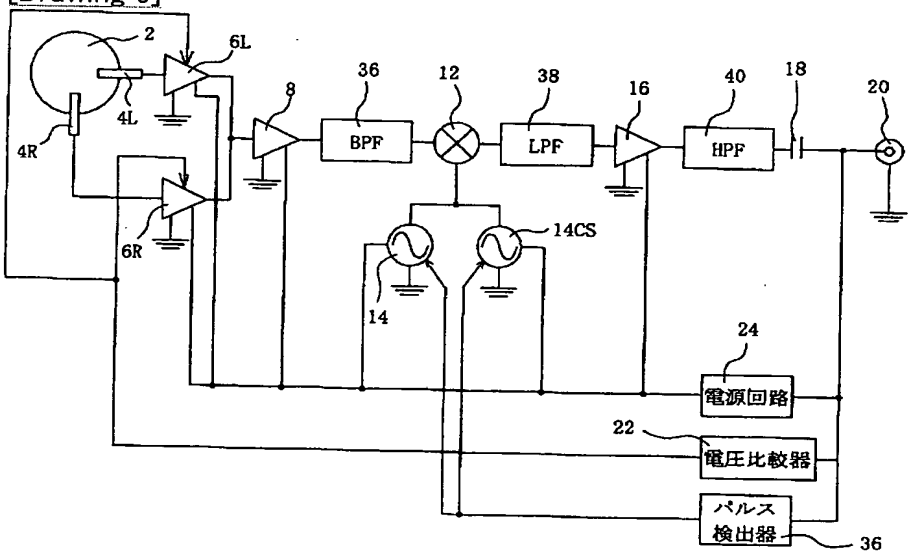
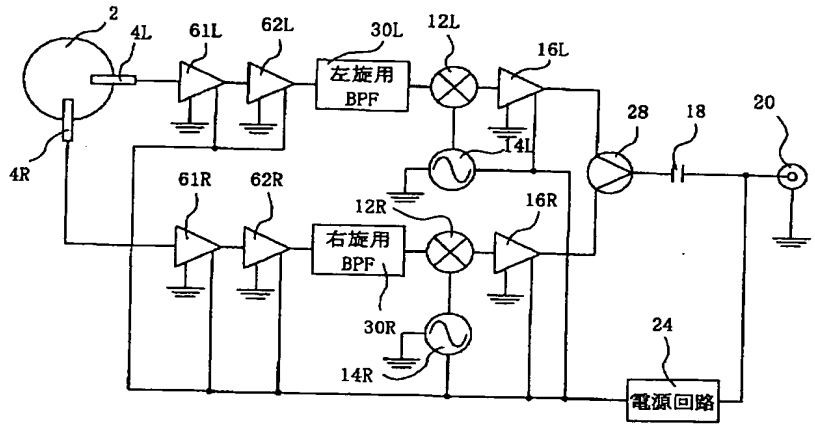
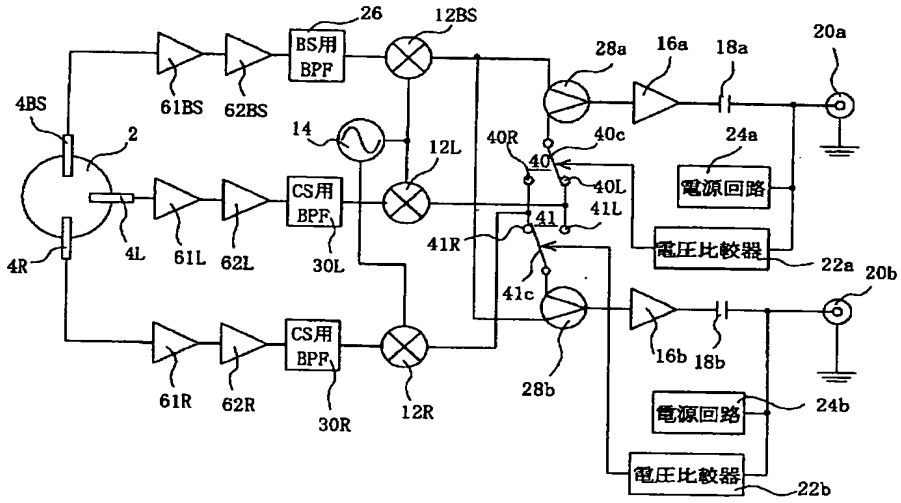
[Drawing 6]



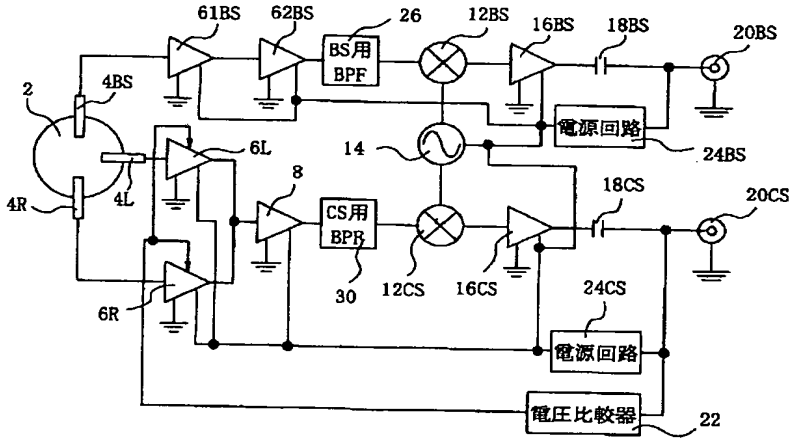
[Drawing 7]



[Drawing 8]



[Drawing 10]



[Drawing 9]

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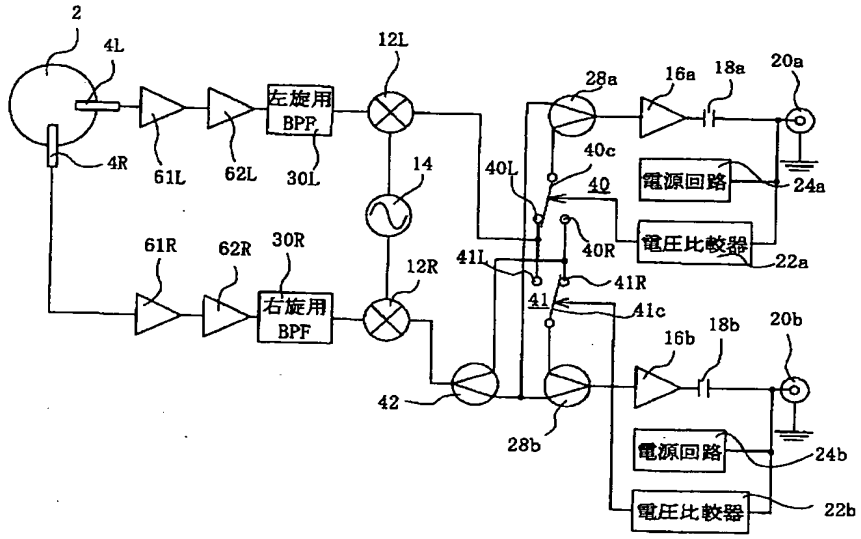
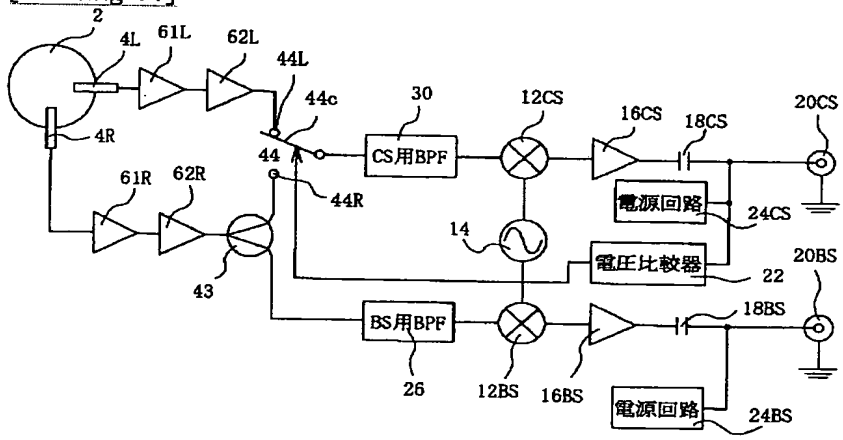


[Drawing 11]



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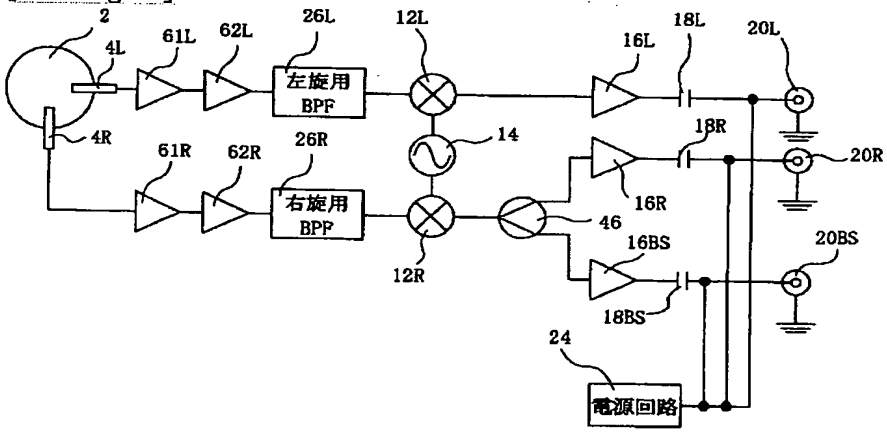
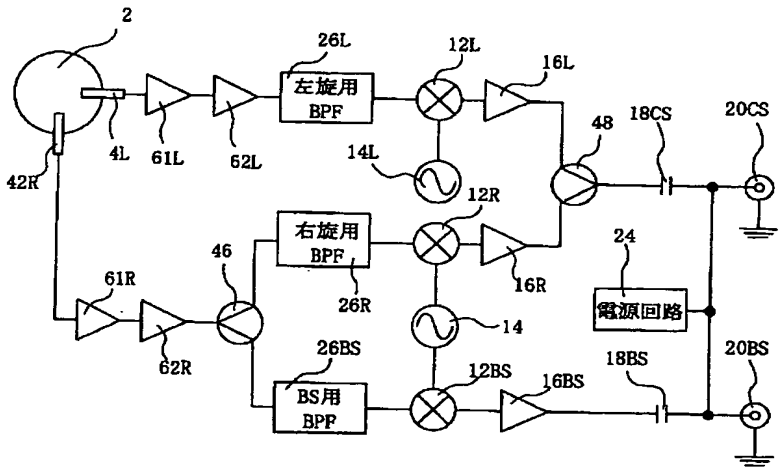
[Drawing 13]



[Drawing 12]



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